REMARKS

Claims 1-51 are pending in the case, of which claims 32-51 are withdrawn from consideration. Claims 1-31 have been examined in the present office action. All claims stand rejected. In the present submission, claim 1 has been amended and claims 33-51 have been cancelled. The title of the application has also been amended. The specification has been amended to conform the figure numbers to the formal drawings. No new matter has been entered. Reconsideration is respectfully requested.

Information Disclosure Statement

Applicant had submitted an Information Disclosure Statement on June 11, 2004, receipt of which was acknowledged by the USPTO by return receipt postcard dated June 14, 2004. In the present office action, the Examiner has returned two pages of a previously submitted Information Disclosure Statement but did not include the two pages of Information Disclosure Statement submitted on June 11, 2004.

The June 11, 2004, Information Disclosure Statement, listed the Kirk patent which was cited by the Examiner in the present Office Action. Thus, the Kirk patent has been considered by the Examiner. However, the second page of the June 11 Information Disclosure Statement listed an article by Stark et al. (a copy of which was submitted to the Patent Office) which has not been considered by the Examiner. Applicant submits herewith a copy of the Information Disclosure Statement listing the Stark article for the Examiner's reference. Applicant respectfully requests the Examiner to consider this reference and return a copy of the signed Information Disclosure Statement to Applicant for record.

Drawing Objection

The Examiner has objected to Figures 1 and 2 of the drawings. Figures 1 and 2 have been amended to include the "Prior Art" legend as required by the Examiner. Applicant submits herewith amended Figures 1 and 2 with the proposed changes for the Examiner's approval. Formal drawings for all the figures in the case, including amended Figures 1 and 2, will be submitted in a separate paper to the Official Draftsperson.

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§102(a)/ §103(a) Rejections based on Sahin et al.

Claims 1-7, 9, 11-17, 19-28, 30 and 31 have been rejected under §102(a) as being anticipated by Sahin et al. ("Harmonic Cantilevers for Nanomechanical Sensing of Elastic

Properties," Proceedings of the 12th International Conference on Solid State Sensors, Actuators and Microsystems, pp. 1124-1127, June 2003). Applicant traverses the rejection.

Applicant submits that the published article by Sahin et al. constitutes Applicant's disclosure of the inventors' own work within one year before the filing of the present application. A declaration under 37 CFR 1.132 is submitted herewith establishing that the article is describing Applicant's own work. (See MPEP 716.10 and 2132.01.) As stated in the Rule 132 declaration, the coauthors of the article, G. Yaralioglu, R. Grow, and S. F. Zappe, are not inventors of the claimed invention of the present application. Per *In re Katz*, 687 F.2d 450 (CCPA 1982), Applicant submits that the enclosed Rule 132 declaration is sufficient evidence to establish the fact that the Sahin et al. article discloses subject matter invented by the Applicant, notwithstanding the authorship of the article. Therefore, the Sahin et al. article should be removed as a reference under §102(a).

With the removal of the Sahin et al. article, the §102(a) rejection of claims 1-7, 9, 11-17, 19-28, 30 and 31 is now moot.

Furthermore, the Examiner rejected claims 8, 10, 23-27 and 29 under §103(a) as being unpatentable over Sahin et al. The Examiner contends that the additional limitations in claims 8, 10, 23-27 and 29 are obvious in view of the Sahin et al. article. The Examiner has also rejected claim 18 under §103(a) as being unpatentable over Sahin et al. as applied to claim 15 and further in view of Kirk et al. (U.S. Patent 5,444,244; hereinafter "Kirk").

For the above reasons, the Sahin et al. article should be removed as a reference under §103(a). With the removal of the Sahin et al. article, the §103(a) rejection of claims 8, 10, 18, 23-27 and 29 is now moot, as the remaining reference (Kirk) does not disclose each and every limitation of the rejected claims.

§102(a)/ §103(a) Rejections based on Admitted Prior Art and Bagley

Claims 1-4, 6, 8, 10-13 and 23-30 have been rejected under §103(a) as being unpatentable over Applicant's Admission (Admitted Prior Art) in view of Bagley et al. (U.S. Patent No. 5,924,845; hereinafter "Bagley").

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Furthermore, claims 5, 15-17, 19, 21, 22 and 31 have been rejected under §103(a) as being unpatentable over the Admitted Prior Art in view of Bagley and further in view of Fretigny et al. (U.S. Patent No. 6,349,591).

Finally, claims 7, 9, 11-22 and 30 have been rejected under §103(a) as being unpatentable over the Admitted Prior Art in view of Bagley and further in view of Kirk. The Applicant traverses the rejection.

The Examiner contends that Applicant describes in Figures 1 and 2 and in pages 1-3 of Applicant's specification an AFM that employs a cantilever that is vibrated "close to one of its flexural resonances, typically the fundamental resonance frequency." However, Applicant's admitted prior art "does not refer to an 'integer number', or clearly state that that shape is 'selected' to tune the fundamental frequency." (See Office Action, pp. 3-4.) The Examiner further contends that "it would have been obvious that Applicant's described cantilever has a shape that provides for higher resonant frequencies being an integer multiple of a first resonant frequency as Bagley teaches (col. 1, lines 30-35) that cantilevers retain an 'integer multiple' (col. 1, line 32) relationship." (See Office Action, p 4.) Applicant respectfully submit that the Examiner's reliance on Bagley is misplaced and that Bagley, in combination with the Admitted Prior Art and the other cited references, does not teach or suggest the limitations of the rejected claims.

Bagley

Bagley describes an apparatus and method for dynamically absorbing resonant vibration in jet engine blades and other rotating turbomachine components over all engine speeds. (See Abstract of Bagley.) In the relevant section of Bagley cited by the Examiner (col. 1, lines 22-36), Bagley describes the ***modelling*** a jet engine blade as a cantilever beam:

> For example, a jet engine blade attached to the circumference of a jet engine rotor **may be viewed as a simple cantilever beam** which, as it rotates, experiences various bending forces, such as the aerodynamic forces, or kick, imposed on it each time it rotates past a stator (a stationary blade). As a cantilever beam, **it will have resonant frequencies** representing various bending modes in which it will simply bend, or whip, back and forth, bend with one wave along its length, bend with two waves along its length, and so forth, **with each higher resonant frequency typically being an integer multiple of a first resonant frequency**. If excited by an alternating force having an excitation frequency the same as a resonant frequency of the blade, the excitation force will cause increasingly greater blade oscillations in that vibration mode...(emphasis added).

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However, Bagley went on to state that (col. 1, line 66 to col. 2, line 5):

> **Modern jet engine blades are better modeled as plates than as beams,** so that they have more complicated vibration modes, including, in addition to conventional bending modes, torsion modes and chordwise bending modes. All these vibration modes combine to determine **the actual resonant frequencies** for a particular jet engine or other turbine or turbomachine blade. (Emphasis added)

Thus, when Bagley is viewed as a whole, it is clear that Bagley, in modelling a jet engine blade as a cantilever beam, was describing the ***theoretical*** characteristics of the jet engine blade such modelled. Even Bagley recognizes that the ***actual*** resonant frequencies for a particular jet engine depend on many factors.

Bagley is directed to reducing resonant vibration in jet engine blades. Bagley went on to describes methods for providing vibration absorption or damping, ultimately proposing a particular centrifugal pendulum absorber for attenuating resonant vibration in jet engine blades over all engine speeds. (See generally, Bagley, Background of the Invention.)

Claim 1

Claim 1, as filed, is patentable over the Admitted Prior Art in combination with Bagley at least because the combination does not teach or suggest a "cantilever for use in an atomic force microscope... the cantilever arm **has a shape selected to tune the fundamental resonance frequency** of the fundamental mode **or a resonance frequency of a selected higher order mode** so that the resonance frequency of the selected higher order mode and the fundamental resonance frequency **has an integer ratio**" (emphasis added). The Examiner agreed that the Admitted Prior Art does not teach or suggest the aforementioned limitation of claim 1. Applicant submits that Bagley is not an analogous prior art and actually teaches away from the claimed invention of claim 1.

Nonetheless, Applicant amended claim 1 to recite in the body of the claim that "the cantilever is to be used in an atomic force microscope." Therefore, the cantilever of claim 1 is distinguishable from cantilever structures that are not capable of being applied in an atomic force microscope.

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Bagley, alone or in combination with the Admitted Prior Art, does not teach or suggest the limitations of amended claim 1 for at least the following reasons.

First, Applicant submits that Bagley, directed to reducing resonant vibration in jet engine blades, is not an "analogous prior art" as a basis of the §103(a) rejection of claim 1. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446 (Fed. Cir. 1992). Bagley is concerned entirely with an apparatus and method for absorbing or suppressing vibration in rotating machinery, such as jet engine blades. Meanwhile, Applicant's claimed invention is directed to cantilevers for use in atomic force microscopy which enables imaging at higher harmonic modes of the excitation frequency. By use of the term "atomic force microscope" in the preamble and the body of claim 1, Applicant made clear that the cantilever as claimed is a microscopic structure, far different from a jet engine blade or other rotating machinery. Bagley is therefore not an analogous prior art because reducing resonant vibration in jet engine blades is not in the field of Applicant's endeavor which concerns cantilevers for atomic force microscopy. Also, reducing resonant vibration in jet engine blades is not reasonably pertinent to the particular problem with which the inventors of the present application were concerned. Moreover, one of ordinary skill in the art would not combine the teachings of the Admitted Prior Art and Bagley as the Admitted Prior Art deals with a cantilever for atomic force microscopy while Bagley deals with a jet engine blade.

In fact, Bagley, directed to reducing resonant vibration in jet engine blades, teaches away from the claimed invention. "A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc. v. Garlock, Inc.* 721 F.2d 1540 (Fed. Cir. 1983). Bagley is concerned with reducing or suppressing vibration for a particular vibration mode for jet engine blades. When Bagley is viewed as a whole, the teaching in Bagley is directly opposite to the purpose of the claimed invention where the vibration of a cantilever arm for a higher order mode is to be enhanced by tuning either the resonance frequency of the selected higher order mode or the fundamental resonance frequency to an integer ratio. Applicant explains the purpose of the claimed invention in paragraph [0033] of the specification as follows:

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> Specifically, the harmonic cantilever of the present invention enables TM-AFM imaging at higher harmonics by **mechanically amplifying the higher eigenmode vibrations** and thereby increasing

> the resolution of imaging at higher order modes. In one embodiment, the ratio of the fundamental resonance frequency and the resonance frequency of a higher eigenmode of the harmonic cantilever of the present invention is tuned to be an integer value or near integer value to **enable amplification of the higher eigenmode vibrations.** (Emphasis added.)

Thus, Bagley, by describes adsorption or suppression of resonant vibrations in jet engine blades, actually teaches away from the claimed invention of claim 1 where the resonant vibrations of the inventive cantilever are actually amplified.

Finally, while Bagley describes that a jet engine blade can be modelled as a cantilever beam where the cantilever beam "will have resonant frequencies representing various bending modes...with each higher resonant frequency typically being an integer multiple of a first resonant frequency," Bagley is simply described the theoretical or expected characteristics of a jet engine blade modelled as a cantilever beam. Contrary to the Examiner's assertion, Bagley does not teach or suggest "that cantilevers retain an 'integer multiple'...relationship." Even Bagley recognizes the "actual" resonant frequencies of a particular jet engine blade are determined by numerous factors. More importantly, Bagley does not teach or suggest selecting a shape for the cantilever arm for the purpose of "tuning" the resonant frequencies of the cantilever arm, as recited in claim 1.

Applicant explains in paragraph [0035] of the specification:

> **In conventional cantilevers, the resonance frequencies of the higher order modes are located arbitrarily in the frequency domain.** As a result, the higher order harmonics cannot excite the higher resonance frequencies efficiently. However, **the harmonic cantilever of the present invention is configured so that the resonance frequency of a higher order mode is an integer multiple of the fundamental resonance frequency.** Since the higher harmonics are located at integer multiples of the driving frequency that is at or near the fundamental resonance frequency, **efficient resonant excitation can occur** when the ratio of the frequencies of a higher order mode and fundamental mode is tuned to an integer value.

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Thus, Applicant explained that a conventional cantilever does not have ***actual*** resonant frequencies that are integer ratio of each other. Applicant's claimed invention provides for the tuning of the actual resonant frequencies so that a selected high order mode is an integer multiple of the actual fundamental resonant frequency. Bagley, in a entirely different field of

endeavor and teaching away from the claimed invention, does not teach or suggest the limitation of "the cantilever arm ha[ving] a shape selected to tune the fundamental resonance frequency of the fundamental mode or a resonance frequency of a selected higher order mode so that the resonance frequency of the selected higher order mode and the fundamental resonance frequency has an integer ratio," as recited in claim 1.

Claims 2-31

Claims 2-31, dependent upon claim 1, are patentable over the Admitted Prior Art and Bagley, alone or in combination, for at least the same reasons that claim 1 is patentable. Fretigny and Kirk fail to cure the deficiency of the Admitted Prior Art and Bagley. Thus, claims 2-31 are patentable over the Admitted Prior Art and the cited references.

For the above reasons, withdrawal of the §103(a) rejection of claims 1-31 is respectfully requested.

CONCLUSION

After the present amendment, claims 1-32 are pending in the present application. For the above-stated reasons, Applicant respectfully requests withdrawal of the §102(a) and §103(a) rejections of the claims. Passage of the case to allowance is respectfully requested. If the Examiner would like to discuss any aspect of this application, the Examiner is invited to contact the undersigned at (408) 382-0480.

Certification of Facsimile Transmission

I hereby certify that this paper is being facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Signature — December 20, 2004 Date

Respectfully submitted,

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